UNIVERSITI TEKNOLOGI MARA

STUDY ON NANOSTRUCTURED ZINC OXIDE THIN FILMS CHARACTERISTICS

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Thesis submitted in fulfillment
of the requirements for the degree of
Master of Science

Faculty of Mechanical Engineering

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

The Nanostructured zinc oxide (ZnO) materials in thin film have been achieved using electrochemical deposition (ECD) method. The morphology, crystal structure and optical properties of ZnO nanostructures have been characterized. The best potentials for deposition were -1.0V and -1.1V using ECD method. Analysis using (FESEM) showed that ZnO nanoparticles and nanorods growths uniformly. The XRD patterns of ZnO nanostructures thin films shows evident in good arrangement of crystal structure properties that has been investigated in high deposited temperature at 95°C and annealed at 500°C. It is proved that ZnO thin film texture surface with the c-axis perpendicular to the substrate surface. Deposition of ZnO seed catalysis growth of hexagonal wurtzite structure of ZnO and exhibited good arrangement of ZnO nanorods growth investigated at -1.0V, -1.1V, -1.2V, 1.3V and -1.4V of the potential applied. The highest transmittance spectra of -1.0V potential applied showed 80% transmittance spectra compared to that of other potentials which deposited at high deposition temperature. For piezoelectric properties, results at -1.0 V, -1.1 V and -1.2 V of ZnO thin films can give signal corresponding to the average of current output 600 μA, 200 μA and 50 μA, respectively. As a conclusion, the excellent ZnO nanostructures properties growth by ECD method has been achieved for the best deposition potential at -1.0 V and -1.1 V. Otherwise to improve the crystallites of ZnO has been prepared at high temperature deposition 95°C compare low temperature deposition. The high percentage transmittance has been exhibited at 80% after annealed in oxygen furnace to improve the optical properties.

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